

Reconstructing the four dimensions of environmental change with a community-driven archive of paleoclimate data

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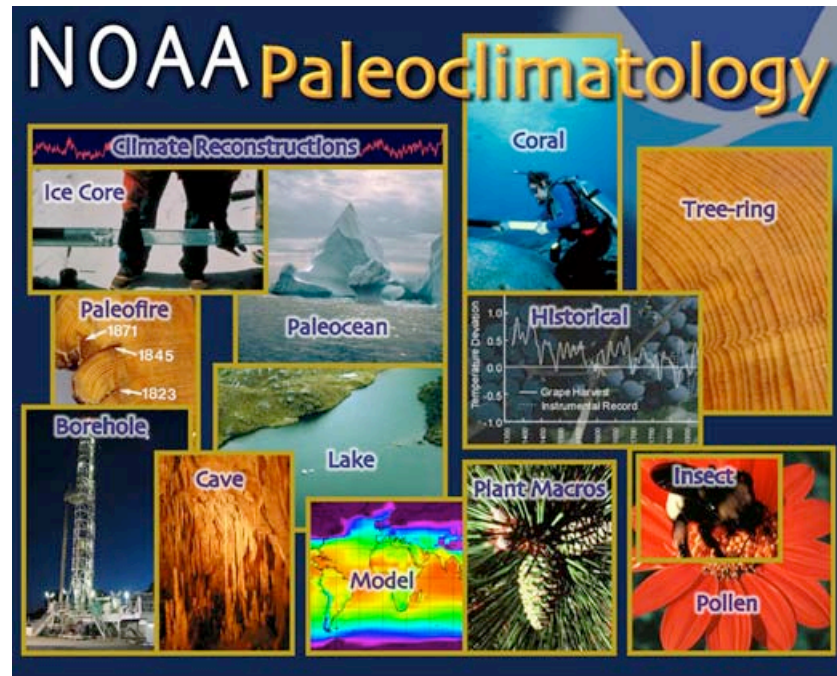
Outline

- Introduction
 - World Data Center for Paleoclimatology archive
- Discussion
 - Grand Challenges
 - Decadal climate variability
 - CO₂ and temperature
 - Earth System modeling
 - How we can help you

A vision..

- You are the next generation, engaging a set of scientific problems where large data collections can be helpful
- You have the chance to set a new model for data sharing
 - Archiving data when published (Alicia Newton)
 - Contributing to **'clean research databases'**
 - Helping us fix errors!
 - Increasing your citation rate!
- Youth and skill can overcome age and treachery!

World Data Center for Paleoclimatology by the numbers



10,000 sites

2,000 data contributors

13 proxies

1 # rank in Google for
paleoclimatology

World Data Center- What works

- Catalog
 - Over 10,000 sites, working to combine with Pangaea, later with MEDIAS, other archives
 - Most of the last 2,000 year data, most of the Science/Nature data, 2% of *all* other paleo data
- Independent databases: The seven dwarves
 - International Tree Ring Data Bank
 - North American Pollen Database
 - Michigan Borehole Database

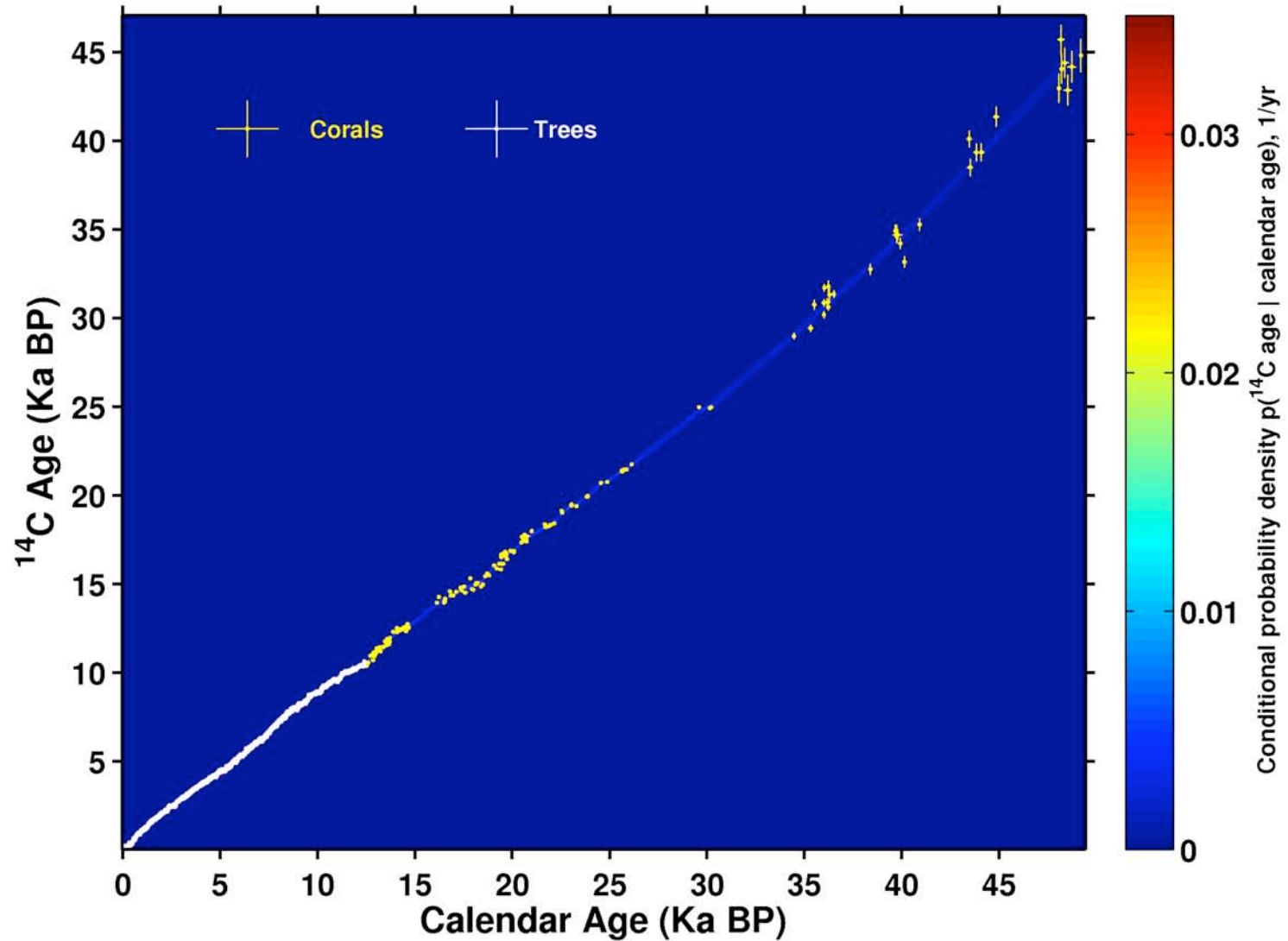
World Data Center- What has not worked

- Can we make one all-inclusive database that contains pollen, marine sediment, ice core, ocean, lake sediments, and other proxies?
 - Can we create the database, can we extract what we need?
 - Will people contribute all the information needed to document and quality-control the database?
- Data model comparison
 - Equilibrium simulations make comparison difficult
 - Model results not often contributed, awkward formats
- Current strategy is to focus on two targets
 - Last 2,000 years
 - Last 20,000 years

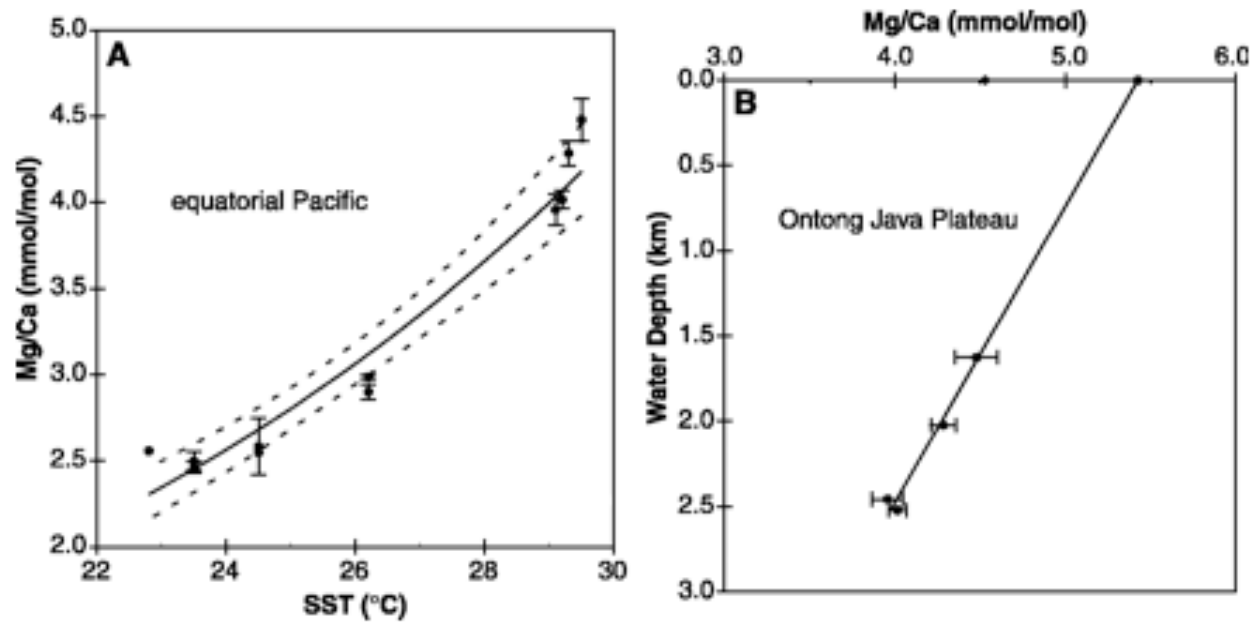
Why is data sharing so important in paleo?

- The four dimensions
- Archive is needed to blend paleo with the instrumental record
- Recalibrating the time series (age and reconstructed variable)
 - radiocarbon time scale
 - Calibrating Mg/Ca in foraminifers to sea surface temperature

Changing radiocarbon calibration



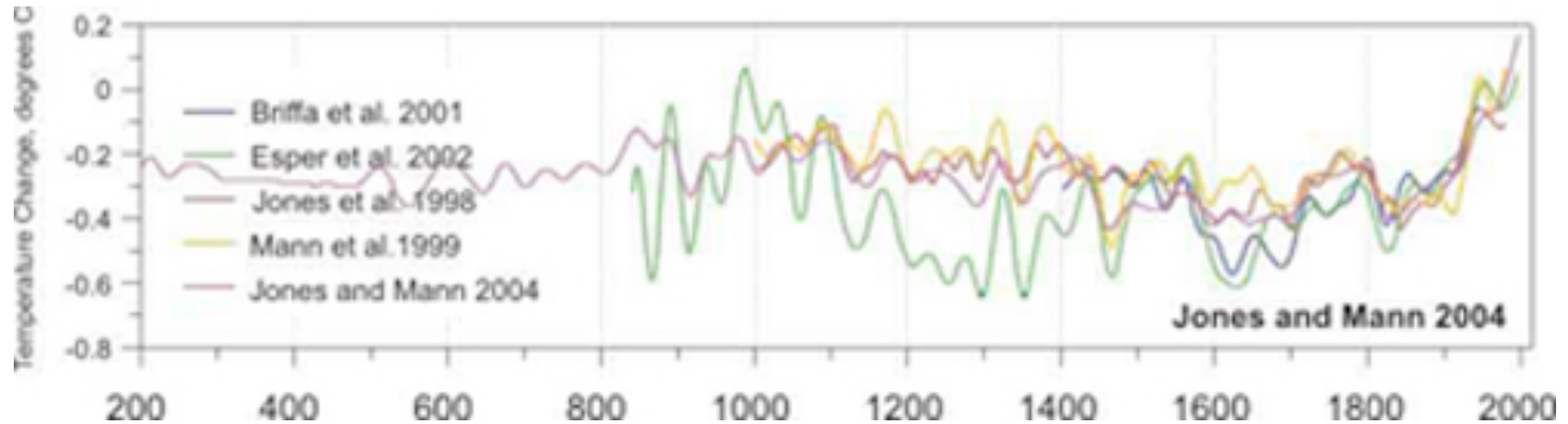
Changing proxy calibration Mg/Ca example



Discussion

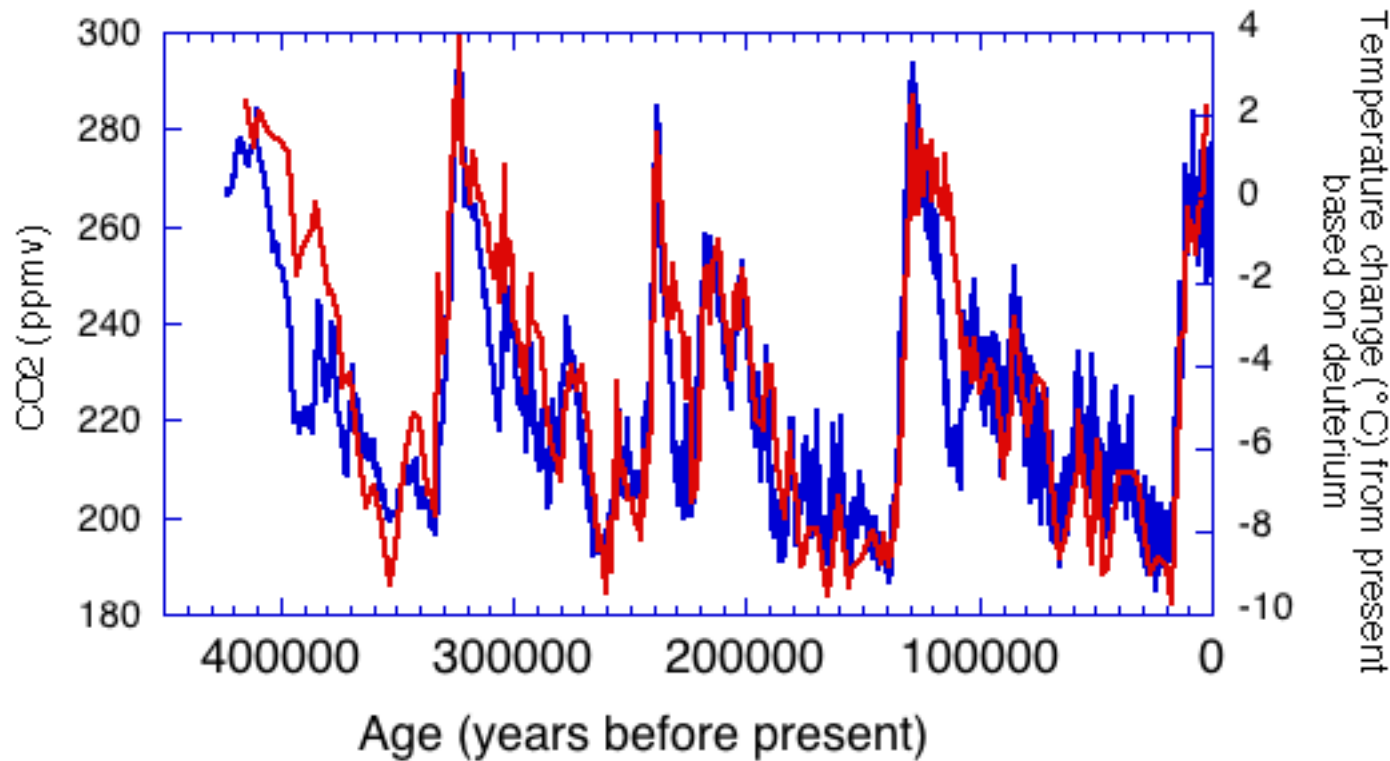
- What are the big problems where an archive can help?
- For each problem, what do we need? What are the incentives and obstacles to sharing data?
- A few problems include:
 - Decadal prediction
 - CO₂ and temperature
 - Earth System Modeling

Decadal prediction



- *How much will anthropogenic warming affect climate (temperature and rainfall patterns) in the next ten years?*

CO2 and Temperature



- *What are the feedbacks between carbon dioxide and temperature?*

Earth System Modeling

- ‘We are doing pretty well at modeling the physical climate system (ocean and atmosphere), behind in modeling all the components (ice sheets, land surface, biosphere)’ -*recent national report*
- Time scale of many coupled processes is slow (centuries), approachable using paleo data
- Ultimate goal is to assimilate paleo observations

Discussion

- The big problems
- Incentives to data sharing
- Obstacles to data sharing

What are the big problems

- --

The incentives

- --

The obstacles

- --

Examples of projects underway

- Paleoclimate Reconstruction Challenge
- Arctic Last 2,000 years
- TRIDAS (tree ring database)